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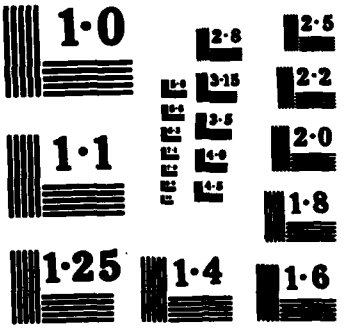
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A shared database encompasses data of interest to a variety of users. A database view provides a class of users with an image of a portion of the data presented according to the needs of these users. The ability to translate updates specified against the view into updates specified against the database is necessary to allow more effective use of views. Since a user accessing the database through a view has limited knowledge of the entire domain of the database, it is necessary to limit the effect on others of a particular user's view update. Furthermore, there may be many ways to translate a particular view update into database updates. Bancilhon and Spyratos propose the notion of a constant complementary view, which partially solves the problem of view updates by addressing these two issues. The authors present a reasonable view update translator that does not preserve any complement. This illustrates the overly restrictive consequences of the requirement that a complement remain constant.

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On "Update Semantics and Relational Views"

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ABSTRACT. A shared database encompasses data of interest to a variety of users. A database view provides a class of users with an image of a portion of the data presented according to the needs of these users. The ability to translate updates specified against the view into updates specified against the database is necessary to allow more effective use of views. Since a user accessing the database through a view has limited knowledge of the entire domain of the database, it is necessary to limit the effect on others of a particular user's view update. Furthermore, there may be many ways to translate a particular view update into database updates. Bancilhon and Spyratos propose the notion of a constant complementary view, which partially solves the problem of view updates by addressing these two issues. We present a reasonable view update translator that does not preserve any complement. This illustrates the overly restrictive consequences of the requirement that a complement remain constant.

KEYWORDS. Relational databases, database theory, complementary mappings, view update.

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1. Introduction

We wish to control the effect of the actions of users of shared databases on other users without unnecessarily restricting these actions. Views provide an image of a portion of the database according to the user's needs [Stonebraker 75]. The problem of translating an update specified against the view into an update specified against the database has been explored [Bancilhon 81, Dayal 82, Keller 82] but not completely solved. One consideration is that various alternatives may exist, all of which implement the request desired by the user from the user's point of view. However, some of these translations may make unnecessary changes to others part of the database that do not affect the view.

Bancilhon and Spyratos [81] propose that a complementary view – one that contains all the information in the database not contained in the user's view – be held constant in order to preclude these "side effects" that may affect other users. This approach provides that any translation from a view update to a database update must be unique. Unfortunately, this rules out many reasonable translations that are otherwise acceptable. We present a particular view update translator that is quite reasonable, but that does not preserve any complement.

2. Definitions

We assume the reader is familiar with relational database theory as presented by Ullman [82] and Maier [83]. Prior work on complements [Bancilhon 81, Keller 84] will also provide useful background.

DEFINITION [Bancilhon 81]. Let f and g be two functions whose domain is D. Then f and g are *complementary mappings* if

$$[\forall x, y \in D][(x \neq y) \wedge f(x) = f(y) \rightarrow g(x) \neq g(y)].$$

COROLLARY. Given a database D and a view v and a complementary view c, there is at most one database state that corresponds to a desired view state (range of v) for a fixed view state (range of c).

The consequence of this corollary is that a view update translator that holds a complement constant has at most one translation. There are, however, view update translators that have at most one translation that do not hold any complement constant. In the next section, we will a reasonable one.

3. A View Update Translator

Consider the relation AB, with two attributes A and B, and the functional dependency $A \rightarrow B$. Let the domain of A contain at least one element, a1, and the domain of B contain at least two elements, b1 and b2. We define the view V to select all tuples from AB where B = b1.

We shall define a view update translator that accepts all single tuple updates valid in the view.

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Insert tuple ⟨a, b⟩: If there exists a tuple ⟨a, y⟩, then replace ⟨a, y⟩ with ⟨a, b⟩, otherwise insert ⟨a, b⟩.

Delete tuple ⟨a, b⟩: Delete tuple ⟨a, b⟩ from the underlying database.

Replace tuple ⟨a, b⟩ by tuple ⟨c, d⟩: Perform translation for deleting ⟨a, b⟩ followed by translation for inserting ⟨c, d⟩.

Let us consider the translations of the insertion of the tuple ⟨a1, b1⟩ starting with two different database states using this view update translator.

Initial database state 1:
A *B*
a1 b2

Initial view state 1:
A *B*
(empty relation)

Result database state 1:
A *B*
a1 b1

Result view state 1:
A *B*
a1 b1

Initial database state 2:
A *B*
(empty relation)

Initial view state 2:
A *B*
(empty relation)

Result database state 2:
A *B*
a1 b1

Result view state 2:
A *B*
a1 b1

We observe that initial view state 1 and initial view state 2 are the same, yet initial database state 1 and initial database state 2 are different. Therefore, any complement view must have different values for initial database state 1 and initial database state 2. However, the result database states are the same. Thus, the result complement states must be the same. Consequently, the complement cannot be remain constant.

If we wanted to hold constant a complement, we could, for example, choose the complement formed by selecting all tuples with $B \neq$ b1. This would preclude accepting the insertion request above for database state 1. We could define another translator that holds another complement constant, but it could not implement all of these requests in the same way.

4. Conclusion

While view complements provide insight into the process of view update translation, requiring that a complement be chosen that remains constant is too restrictive. Bancilhon and Spyratos [81] prove that alternative (minimal) complements exist, but do not indicate how to generate all of them. They also do not show how to derive a view update translator given a constant complement. We suggest that further work consider the generation of alternative view update translations with limited effects on parts of the database not appearing in the view.

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